Quantification and Comparison of Protein Content in Photosynthetic and Non-Photosynthetic Tissues of Six Plants at KCC

Jazmin Ausley
Mentor: Farshad Tamari, Ph.D.
College: Kingsborough Community College

Primula vulgaris is a small-growing plant used for its aesthetics properties due to variations in flower color. It is somewhat poisonous when ingested. *Pinus thunbergii* is consumed for several health benefits like its hair growth, anti-inflammatory and diabetes-fighting properties. *Pinus strobus*, the tree often used for Christmas decoration, can grow to be massive and litters the forests of North America. *Rhododendron ponticum* is an invasive species that originates from Iberia and has crippling effects on the natural fauna affecting European countries the most. *Taxus cuspidata* and *Hydrangea macrophylla* are very common types of shrubs used medicinally and are native to Asia, particularly to Japan, despite also being poisonous when ingested. *T. cuspidata* has health benefits due to possessing taxol, an anti-cancer agent which it produces in its needles. *H. macrophylla,* varies in color, naturally produces phyllodulcin which is useful as a sugar substitute for people suffering from diabetes.

The goal of this investigation was to determine the total protein content in photosynthetic tissues of six plant species, and in non-photosynthetic tissues of one species. To achieve this, we extracted total protein from plant tissue and compared the protein content of photosynthetic tissues and in one species, non-photosynthetic tissues as well. We hypothesized that 1. Photosynthetic tissues of six different species will have the same relative protein content due to functional similarities and; 2. Non-photosynthetic tissues will have different levels of protein content due to different functional properties.

The Bradford Assay is a methodology used to determine protein concentration. The proteins bond with the specific reagent derived from Coomassie Brilliant Blue G-250 to display results that can produce a spectrum of colors that is measured spectroscopically. The results can be measured using a 595 nm wavelength (λ). The colors produced indicate how much protein was able to bind. The Bradford Assay is very useful due to its ease of use as well as its efficiency and accuracy in producing results quickly. Samples were collected from KCC with permission from Buildings and Grounds. *P. vulgaris* was purchased separately from a local nursery. For photosynthetic tissue extraction, we used leaves and needles from all six species, and for non-photosynthetic tissue extractions the petal, sepal, pistil and stamens from *P. vulgaris* were used only. 50µg of tissue was used for every extraction. Plant tissues was extracted in 200µL Phosphate Buffered Saline (PBS) until a homogeneous mixture was obtained. Between 1-5µL of tissue were used in triplicates to quantify total protein content. A standard Bradford assay (BIO-RAD) with the xMark™ Microplate Absorbance Spectrophotometer (also BIO-RAD) generated results. Results were analyzed using Microsoft Excel and SPSS (IBM).

Our results indicate that there is quite a bit of variability in the protein content of photosynthetic tissues when comparing the six species, ranging from 0.31 to 2.40 µg/µL of protein. *P. vulgaris*

appears to have the lowest protein content, while *R. ponticum* appears to have the highest. For non-photosynthetic tissues we used petal, pistil and stamen from *P. vulgaris* in addition to the photosynthetic tissues of leaves and sepals. The highest protein content was observed for stamens, with the lowest belonged to the petals. The range of protein content for *P. vulgaris* tissues was from 0.16 to 0.79 µg/µL.

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